Version

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GUIDELINES FOR CHARACTERIZING, CLOSING, AND ABANDONING SHALLOW INJECTION WELLS

U.S. Environmental Protection Agency – Region 10

Summary for Owners and Operators:

You are most likely reading this document because you currently own and operate a shallow injection well that has been identified by either by the U.S. Environmental Protection Agency (EPA), the State, a local government, a financial institution, or some other entity as a potential environmental liability to your business and/or the property. The purpose of this document is to provide you and your consultant (if you hired one) an outline of a basic process to assess and characterize the condition of the shallow injection well and/or close or abandon the well, if necessary. Since we appreciate and value your efforts to protect drinking water resources, we ask that you and your consultant allow us to help you develop an effective and efficient plan so that your time and resources are not wasted in this process.

Allow us to give you little bit a background about the Underground Injection Control (UIC) program. The federal Safe Drinking Water Act established the UIC program as a means of protecting drinking water resources and ground water quality. While this program regulates all injection activities, i.e., discharges of waste fluids directly into the subsurface, shallow injection wells, also known as Class V injection wells, shallow disposal systems, dry wells, and drainfields, may have the pose the highest threat to underground sources of drinking water (USDWs) because there are many hundreds of thousands of shallow injection wells installed across the United States and they are constructed in a manner in which all of the waste fluids are directly disposed into or above shallow ground water. Ground water is the principle source of drinking water for 50% of the population in the United States.

When we talk about shallow injection wells, the UIC regulations separate wells into two groups: hazardous disposal (Class IV injection wells), which are prohibited, and non-hazardous disposal (Class V) injection wells. It is often difficult to determine which classification applies at a particular site. Unfortunately, there have been many disposal activities have led to water supply contamination and has lead to costly cleanup actions under the state and federal Superfund programs. By properly identifying high-risk shallow injection wells upfront, we are able to protect valuable ground water resources and public health, and help you avoid the costs of extensive ground water remediation.

The types of businesses likely to be affected by the UIC regulations include any business generating wastewater (other than sanitary waste) and disposing it with little or no treatment directly above or into ground water through a septic tank, dry well and/or drainfield. Fuel, waste oil, solvents, heavy metals, and pesticides are among the contaminants of concern. While some generalizations can be made about well systems and contaminant transport, there are many variables in design, use, and hydrogeology, requiring an individual assessment of each injection well.

All injection wells must be listed on the federal or State UIC inventory in order to be authorized by rule to operate. Depending on injection well characteristics and other factors, owners of injection wells may have to complete one or more additional steps outlined in this guidance to protect ground water quality.

Disclaimer. These guidelines only apply for US EPA - Region 10, serving Alaska, Idaho, Oregon, Washington, and Indian lands adjacent to those areas. It does not replace or supercede local or State regulations or policy. Owners are responsible for understanding and complying with these regulations as well as applicable local and State regulations in any closure action.

UNDERGROUND INJECTION CONTROL PROGRAM

Guidelines for Characterizing, Closing, and Abandoning Shallow Injection Wells

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MARCH 20, 2001

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1. Underground Injection Control Program

1.1 What are the different types of Injection Wells?

I	Deep injection, under pressure, of hazardous or non-hazardous waste below the lowermost Underground Source of Drinking Water (USDW.)
II	Deep injection, under pressure, of fluids related to the production of oil and gas, or gas storage
III	Injection of pressurized fluids utilized for mineral extraction
IV	Shallow disposal of hazardous waste into or above a USDW **(PROHIBITED.)**
V	All other types of shallow disposal, into or above a USDW. Some examples include: Aquifer recharge, storage and recovery (including waste treatment plant injection) **Automotive waste disposal*** **Industrial waste disposal (from activities such as manufacturing, food processing, dry cleaning, electroplating)** Storm water drainage Onsite wastewater disposal units serving > 20 persons/day (including cesspools)* Landslide Control Air Conditioning Return Flow Geothermal Energy or Heat Production Return Flow **Examples in bold are those most likely to be affected by this guidance.**

1.2 Programmatic Requirements and Regulations. Federal and State UIC programs are established by statute and implemented through regulations.

a. Federal Safe Drinking Water Act. The primary mission of the Underground Injection Control (UIC) program is to protect all underground sources of drinking water (USDWs). The Safe Drinking Water Act (SDWA) (Sections 1423 and 1431) has authorized EPA and State UIC Primacy programs to enforce and protect ground water quality from subsurface waste fluid disposal practices.

b. What are the regulations regarding shallow injection wells?

Under existing federal regulations (40 Code of Federal Regulation (CFR) Parts 144.12, 144.26, and 144.27), shallow injection wells are "authorized by rule", which simply means that no permit is required if the injection well does not endanger an USDW and the disposal activity complies with other UIC programmatic requirements. If a disposal activity has the potential to endanger ground water quality, a shallow injection well may be required to be operated under a permit. Currently, in Alaska or Indian Lands, there are no EPA permits that are required to be obtained in order to operate a shallow injection well. State specific permits may be required based on the type of injection activity and characterization of the waste fluid. See Part 7.2 for more information on state specific UIC program requirements.

The programmatic requirements to dispose waste fluids, using a shallow injection well are twofold: first, basic inventory information about the shallow injection well must be submitted to EPA or the State Primacy program and second, the shallow injection well must be constructed, operated, and closed in a manner that protects underground sources of drinking water. Copies of the EPA and State Primacy program shallow injection well inventory forms attached at the end of this document.

c. State Regulations **For more information about the State Primacy Programs, see part 7.4.**

1.3 Penalty for Non-Compliance: the Safe Drinking Water Act authorizes EPA to levy penalties of up to $27,500 per day per violation.

2. Do you own or operate a shallow injection well?

2.1 Definition. Shallow injection wells are defined as any subsurface disposal device which is intended to emplace waste fluids into or above aquifers containing 10,000 milligrams per liter (or fewer) Total Dissolved Solids. This definition includes the use of subsurface disposal systems such as dry wells, french drains, boreholes, drainfields, and cesspools, as well as deeper engineered wells that are cased and sealed, much like public water supply wells.

Frequently, shallow injection wells are subsurface disposal systems, such as **onsite sewage systems**, which are constructed to handle solely sanitary wastewater, **but may also used for the disposal of other waste fluids**. The addition of fluids which interfere with biological treatment processes occurring normally in a septic system may cause septic system failure, clogging of leachfields, and discharge of untreated wastewater to the ground and ground water.

Another common construction for a shallow injection well is a subsurface vertical chamber, also called a **dry well**. Drywells may be constructed of metal, plastic, concrete, stone, brick, or any material that will keep soil from closing the hole. Occasionally, abandoned water supply wells that were never properly sealed and/or closed are used for the disposal of waste fluids.

If you own or operate an injection well, or are still not sure whether or not these requirements apply to you, proceed to the next section.

2.2 The Inventory Requirement. All shallow injection well owners are required to submit inventory information to EPA Region 10 (on Indian Lands and Alaska (40 CFR part 144.26)) or the State Primacy program, i.e, Idaho, Oregon, or Washington, in order to be authorized by rule or permit to operate. (For state specific regulations, please see part 7.4) Well Owners are required to submit basic inventory information. Example EPA and State Primacy program inventory forms are included on page 7-1. EPA is required to notify you within 90 days of the regulatory status of your well. You may be:

- Authorized by rule to operate (i.e., no permit will be required). If no further action is required, please keep in mind that you are still responsible for insuring that your injection well is not used for the disposal of hazardous waste or other contaminants. For more information regarding Best Management Practices, check the internet at www.epa.gov/region10/uic.htm

Or EPA may require additional information to determine if your well should be subject to permit requirements or closed. Go to Section 3.

3. Is this an endangering shallow injection well?

3.1 What is endangerment? Endangerment is the release of any fluid which may cause a violation of the drinking water standards, adversely affect a person's health, or exceed State ground water quality standards. Contaminants introduced into underground sources of drinking water through the use of disposal wells include bacteria and viruses, minerals and nitrates, heavy metals, organic chemicals and pesticides.

Maximum Contaminant Levels (MCLs) and Health Advisories are established to define the maximum level of contaminants recommended in drinking water supplies. For more information about MCLs, you can call the Safe Drinking Water Act Hotline at (800) 426-4791, or consult the EPA drinking water website at www.epa.gov/ogwdw. Hazardous materials are those which are toxic, flammable, corrosive or reactive, and are further defined in 40 CFR Part 261, per the Resource Conservation and Recovery Act (RCRA) regulations. For more information, you can call the EPA RCRA Hotline at (800) 424-9346, or consult the EPA waste website at www.epa.gov/oswer/.

Detection of contaminants in concentrations exceeding an MCL (or are otherwise hazardous) may require immediate closure of a shallow injection well.

Table 3a. *Factors influencing likelihood of endangerment*

- waste stream characteristics (regulated and/or hazardous contaminants)
- injection flow rate, years of use
- soil type, depth to ground water, rainfall
- proximity to ground and surface waters
- proximity to public and private water supply wells
- proximity to other injection wells
- frequency of monitoring, sludge removal, other maintenance
- designation of area as vulnerable to contamination by a water quality agency
- whether or not facility uses BMPs to isolate, minimize or eliminate hazardous substances from waste stream

3.2 Waste streams of concern. The following activities have waste streams that have contaminated water supplies, and could be disposed of through shallow injection wells:

Motor vehicle maintenance	Dry cleaning
Photo processing or Printing	Electroplating
Meat Processing, Pickling	Pesticide and Fertilizer Mixing/Use

3.3 Supplemental Inventory Form: the supplemental inventory form will help you and EPA evaluate the potential risk to ground water quality from your shallow injection well. See page 7-2.

3.4 EPA's Determinations: EPA will have ninety (90) days to evaluate and respond. Based on the sample results and geological or hydrogeological information, EPA may require the following:

A. No Further Action: You may continue use of your shallow injection well. Please keep in mind that UIC regulations still apply, and that you should take steps to prevent ground water contamination by properly managing wastewater, hazardous materials and other contaminants at your facility. Your facility may be reinspected.

B. Application for a UIC or State Permit: You will need to apply for a permit that includes routine water quality monitoring. EPA will provide you with the permit application and directions for completing the application.

C. More characterization needed: the injection well may endanger underground sources of drinking water and must be temporarily closed until characterization is complete. Proceed to Section 4.

4. Site Characterization

Any injection well which is known or suspected to contain fluids with concentrations of contaminants that exceed drinking water MCLs, or that are otherwise hazardous, should **immediately be sealed with a cover or temporary plug**. Alternative disposal methods (such as containment in a holding tank) should be used until characterization is complete.

Following the determination of potential endangerment, EPA requires that additional characterization of your facility and associated class IV or V well be done. This section outlines the information and a recommended format.

Copies of all correspondence and reports should be sent to the State UIC or water quality agency and local health department. EPA will help you determine the appropriate contacts at those agencies. We recommend that reports be submitted without elaborate binding or report covers. Electronic transmittals may be acceptable as long as they are followed by signed originals.

Each closure case will be assigned to an EPA UIC staff person, who may coordinate responses with state and local agencies to ensure that closure proceeds in a manner consistent with their policies and ground water protection objectives.

Injection well owners and their consultants are generally requested to respond to EPA information requests within forty-five (45) days.

4.1 Technical Qualifications and Affidavit

Activities involving site characterization require a professional level of expertise. Consultants retained for this type of investigation should be professional civil engineers, geologist or engineering geologists registered by the state in which the work is to be performed. **All proposals and reports related to site characterization activities shall include the following certification signed by the consultant:**

I, {insert name and title here} certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Consultants may not represent the owner to EPA without the owner's consent, verified by telephone (from the owner to the EPA contact) and/or a signed contract from the owner delegating this authority to the consultant.

4.2 Site Characterization Workplan

A site characterization workplan must be approved by EPA **prior** to beginning work. We may require that a local health inspector be present to witness sample collection; local inspection fees may apply. The workplan must include the following information:

A. Site Background

1. Site contacts must be provided. Include the names, addresses and telephone numbers of all people (owner, occupant, consultant) who can be contacted for information. The name of the principal site contact should be specified.

2. History of the site and shallow disposal well use. Include a list of activities performed at the site, and fluids that could enter the injection well. Estimate the volume or rate of fluid disposal and the length of time the operation had been performed.

3. Information on geology, major underlying aquifers, depth to groundwater, gradient direction, groundwater quality, nearby waterways, and proximity of the shallow disposal well to water supply wells.

B. Area and Facility Maps

1. Vicinity Map showing the site location relative to nearby landmarks such as water courses, streets and highways, urban or industrial areas, with North clearly indicated.

2. Plan View Map showing address, on-site buildings, water wells, and any other distinguishable facility characteristics. The map must be drawn to scale with North clearly indicated.

3. Scaled and detailed cross-section drawing (schematic) of the shallow well including, if applicable, the layout of all tanks and piping systems and the location of other subsurface constructions on the property.

C. Sampling Plan (refer to Section 6 for sampling and QA/QC methodologies)

1. Proposed soil and/or groundwater sampling locations and depths including rationale and, if applicable, proposed sampling protocol for fluid and sludge in the injection well. (See Section 6 for sampling methodology and suggested sample locations.)

2. Contaminants to be analysed, the name of the laboratory that will perform the analyses, analytical methods and field investigation quality assurance and quality (QA/QC) plans.

3. Equipment used for sample retrieval.

4. If applicable, proposed methodology for completion and destruction of borings.

5. Disposal procedures used for contaminated or potentially contaminated materials (including drill cuttings, fluids, or sludges generated). Please be aware that hazardous waste manifest regulations may apply.

D. Site Health and Safety Considerations

1. Hazard identification and abatement.
2. Personnel training.
3. Chemical of concern including exposure limits.
4. On-site monitoring and required safety equipment.
5. Emergency information.
6. Personnel protective equipment.

4.3 Site Characterization Report

After site characterization work is completed, a report must be submitted to EPA for review within ninety (90) days from the conclusion of sampling. The report must include, at a minimum, the following information:

A. Brief Summary of the Shallow Injection Well location, construction, and discharge (see 4.2.A.)

B. Site Characterization Findings

1. A map showing the position of all soil and groundwater sampling locations and sample depths, with associated identifying numbers or labels.

2. Boring logs using Uniform Soil Classification System.

3. Soil and/or Groundwater Analytical Results Summary Tables including the following information: boring or sampling number, constituents, units, results, detection limits (which should be below any MCLs) and the depth of samples should be indicated.

4. Signed laboratory-originated analytical data sheets which must specify analytical method, sampling date, date received, sample condition upon receipt, date analysed, dilution factors, and detection limits based on practical limit of quantification. The results of field and laboratory quality assurance samples should also be included, as should comments concerning the presence of unidentified or tentatively-identified peaks.

5. Sample shipment and handling procedures, including chain of custody records and preservation procedures.

6. (Optional) costs associated with sampling and analysis.

C. Recommendations (optional)

Propose options for ensuring that the injection well will not degrade soil or ground water, through closure of the well or other means.

4.4 EPA's Determinations

After receipt of the final Site Characterization Report, EPA will have ninety (90) days to evaluate and respond. Based on the sample results and geological or hydrogeological information, EPA may require the following:

A. No Further Action: You may resume use of your shallow injection well. Please keep in mind that UIC regulations still apply, and that you should take steps to prevent ground water contamination by properly managing wastewater, hazardous materials and other contaminants at your facility. Your facility may be reinspected.

B. Application for a UIC Permit: You will need to apply for a permit that includes routine water quality monitoring. EPA will provide you with the permit application and directions for completing the application.

C. Immediate Closure of the Injection Well and Site Remediation Actions: The injection well is likely to endanger underground sources of drinking water and must be closed. Proceed to Section 5.

5. Closure and Remediation Actions

Following the determination of endangerment to groundwater quality, EPA requires that closure of the Class IV or V well be undertaken and, if needed, remediation of the surrounding soil and/or groundwater. If sampling uncovered substantial levels of contamination beyond what is normally handled by the EPA UIC program, we may at this point refer the site for further action by the EPA or State RCRA (Resource Conservation and Recovery Act) program. If not, we will ask you to proceed with Basic Closure.

5.1 Technical Requirements: See section 4.1 for the discussion on this subject.

5.2 Basic Closure. "Closure" of a shallow injection well means that all residual waste fluid and sludge be removed from constructed conveyances (drain, piping, tank(s), leachfield(s), and/or drywell(s), and that all of those conveyances be either removed and backfilled, or filled in situ, and capped with impervious material, so that no new waste may be discharged via that injection well. If an injection well serves for the disposal of both sanitary waste and an industrial or commercial waste which caused a violation, the use of the constructed conveyances for sanitary wastewater may be resumed after all connections with endangering waste streams are closed. Other repairs (such as leachline replacement) may be necessary to restore effective sanitary waste treatment.

5.3 Closure Workplan: A closure workplan must be approved by EPA prior to beginning work. We may require that a local health inspector be present to witness closure activities; local inspection fees may apply. The workplan must include the following information:

1. Site and Facility Information as requested in Sections 4.2.A and B (if not already completed earlier)

2. Proposed Closure Plan.

a. Removal of contaminated soil and/or groundwater treatment.
b. Type of remediation methods.
c. Disposal procedures used for contaminated materials (including fluids or sludges generated). Please be aware that hazardous waste manifest regulations may apply.
d. Shallow disposal well abandonment procedures.
e. Additional sampling plans.
f. Site Health and Safety considerations.

5.4 Closure Report: After basic closure work is completed, a report must be submitted to EPA for review within forty-five (45) days from the conclusion of closure. The report must include, at a minimum, the following information:

1. Brief Summary of subject Injection Well, actions at site to date

2. Closure Actions

a. A discussion of all closure actions undertaken to ensure that the injection well is no longer injecting fluids via subsurface conduits, highlighting any changes that had to be made to the closure workplan in the course of closure action.

b. A diagram of the closed injection system.

c. Documentation (such as photographs, waste and soil manifests, health agency receipts for witness fees, etc.)

d. A description of alternative waste handling and disposal methods: where will the wastewater formerly discharged to the injection well be disposed? What BMPs or conservation methods might be employed to reduce the generation of wastewater onsite?

e. (Optional) costs of implementing BMPs and/or identifying and constructing alternative disposal site.

5.5 EPA Closure Approval Letter. Upon review and approval of closure report, EPA will send a letter to the owner of the well, with a copy to all cooperating agencies and the site consultant, indicating completion of the closure action for that site. EPA will update its inventory records to show that the site was properly characterized, and closed, and that all known contamination originating from that shallow injection well was remediated to prevent contamination of underground sources of drinking water.

6. Sampling of Shallow Injection Well Sites

6.1 Sampling Medium and Collection

Shallow injection well site characterization generally requires the sampling of fluids and sludges within constructed components or conveyances of the shallow injection well (drain, sump, piping, tanks, leachfield, drywell) and sampling of soils receiving waste fluids from those constructed conveyances.

The need for additional sampling will be determined by the extent of contamination detected in the injection well and receiving soils and the proximity of the injection well to the water table and water supply wells.

The sampling guidance was prepared with industrial and motor vehicle waste streams in mind. If the subject closure relates to a different type of shallow injection well, supplementary guidance and sampling parameters may be required by EPA.

1. Soil Sampling

Soil samples can be collected through the creation of boreholes which can be made with a continuous flight or hollow stem auger, rotary core drill, direct-push technology or other soil collection methods. It is recommended that core sampling equipment avoid the use of drilling fluids since these greatly increase the potential for sample contamination.

The most common procedures for collecting soil samples use a thin-wall steel tube (core barrel), fitted with a brass liner, which is forced into the undisturbed soil at the bottom of the borehole. This is sometimes referred to as drive sampling. Core barrels are generally from one inch to three inches in diameter and 12 to 24 inches long. When the core barrel is retrieved, friction will usually retain the sample inside the barrel in most unsaturated materials.

Samples should be taken at locations where the potential for a high degree of contamination exists (suspected worst-case locations) such as elbows, joints in pipe lines, clarifiers, floor drains, tanks and wells. Several depth borings should be planned to be sampled for chemical analysis. Sample intervals will vary, but in general should be taken between one and two feet beneath the excavation or the bottom of the septic tank, cesspool, well, pipe line or floor drain surface, and then every five (5) feet, at any lithologic changes, and areas of obvious contamination down to the water table. (See pages 6-2 and 6-3 for examples.)

Upon retrieval from the borehole, the sample liners should be removed and placed on clean plastic. Using cuttings or corings, the borehole should be logged to the full depth by an on-site geologist according to the Unified Soil Classification System. After logging, the exposed ends of the liner should be covered. Typically, Teflon sheets and plastic end caps are used and secured with silicone-based tape. After each use, sampling equipment must be decontaminated.

Sample containers are to be labeled with borehole number, depth of sample, site identification, required analytical method, date and time of sample collection and initials of person collecting the sample. These samples are to be immediately placed in a refrigerated ice chest containing dry ice in order to minimized volatilization for transport to a certified laboratory under proper chain-of-custody protocol. If crushed ice or block ice is used, sample temperature must be recorded on chain-of-custody forms immediately upon receipt by the laboratory. This can be accomplished by placing a thermometer in the cooler used for transport. Soil samples shall not be held for more than fourteen (14) days prior to analysis and at all times be dept at 4 degrees centigrade pending analysis.

2. Liquids

a) Volatile Organics: Samples for volatile organics are generally taken first to minimize the disturbance of the fluid and resulting loss of volatiles. Prior to sampling, an oil/water interface probe should be first utilized to define the base of any free floating product encountered while sampling. If no floating liquid phase is present, a sampling device can be lowered into the fluid -- as deeply as possible without disturbing the sediment -- and extracted with a representative grab sample of fluid. The fluid can then be transferred to pre-chilled, pre-labeled 40-ml volatile organic analysis (VOA) vials with Teflon septa.

The sample should be preserved by adding hydrochloric acid (HCl) to a pH of less than 2. Two 40-ml vials should be obtained for each VOA sample. When analyzing using the Toxicity Characteristic Leaching Procedure (TCLP), bear in mind that the volume of sample to be collected is dependent on the solids content of the sample. Sufficient sample volume is needed to allow for each physical

phase to be analyzed separately. Sample bottles should be filled as completely as possible so that no head space remains. Do not add HCl to samples that will be prepared using the TCLP.

If a separate floating phase is encountered while sampling, a sampling device that collects fluid from beneath the floating phase should be used. This device is operated by gently lowering it in the closed position to a depth below the oil/water interface, carefully opening and filling it with sampling fluid, and then closing and retrieving the sample.

When transferring the sampling fluid from the sampling container to a VOA vial, the fluid must be poured slowly and smoothly to produce a meniscus over the lip of the vial. The screw-top lid with the Teflon septum is then tightened onto the vial, and the vial turned upside down and gently tapped to check for the presence of air bubbles. If air is trapped in the vial, i.e. head space is present, the sample must be retaken. VOA samples should not be taken near any exhaust systems which may cause contamination of the sample.

All sample containers shall be labeled with borehole number or sampling location, site identification, date and time of sample collection and then transmitted to a certified laboratory under proper chain-of-custody protocol. A temperature reading should be recorded on the chain-of-custody form immediately upon receipt by the laboratory. Water samples shall not be held for more than fourteen (14) days prior to analysis and at all time be kept at four (4) degrees centigrade pending analysis.

b. Semi-Volatile Organics: Samples for semi-volatile organics should be collected after those for volatile organics. The method of collection is the same as that described for volatiles except that after the fluid is collected, it should be transferred to a pre-labeled, one-liter amber glass bottle with a Teflon septum. The sample must be tagged and chilled to approximately 4°C for shipping to the analytical laboratory.

c. Metals: Samples for total metals should be taken after those for volatile and semi-volatile organics. After collection, the sample is transferred to a one-liter, polyethylene, certified metal-free bottle and the unfiltered sample is acidified with 1:1 redistilled HNO_3 to a pH of less than 2 at the time of collection. Do not add HNO_3 to samples that will be analyzed for mercury or those that will be prepared using the TCLP.

d. Total Petroleum Hydrocarbons (TPH): Use collection methods described for sampling for volatile organics. If sampling for TPH as gasoline, the fluid should be transferred to two pre-labeled 40-ml VOA vials with Teflon septa (as described for volatile organics). If sampling for TPH as Diesel, the fluid should be transferred using a funnel to a pre-labeled, one-liter glass bottle with a Teflon septum. Preserve the sample by adding hydrochloric acid (HCl) to a pH of less than 2. The sample must be tagged and chilled to 4°C for shipping to the analytical laboratory.

e. Total Recoverable Petroleum Hydrocarbons (TRPH): Use the collection methods described for volatile organics. The fluid should be transferred to a one-liter glass bottle with a Teflon septum. The sample must then be preserved, tagged and chilled as above.

3. Sediments (sludge)

Often sediment samples from the bottom of a shallow injection well are collected using a beaker attached to a pond sampler. A stainless steel lab scoop is generally used to transfer the sediment from the beaker to the required container. Sediment samples should be placed in an 8-oz. wide-mouthed glass jar. The jar should be completely filled so that no headspace is present. After being

taped and labeled, the sample should be placed immediately in an ice chest and kept at four (4) degrees centigrade for delivery to the laboratory. Care should be taken throughout to avoid contamination of both the inside and outside of the jar and its contents.

6.2 Sample Analysis

For typical well closure activities, EPA Region 10 requires that all samples associated with closure be analyzed for the compounds listed below using the indicated methods. Analysis for semi-volatile organic compounds is only necessary when such compounds are suspected of being in the waste stream. EPA will provide site-specific instruction in its correspondence with the owner and/or the designated contractor.

1) Volatile Organics: EPA Method 8240 (Volatile Organics); EPA Method 8260 (Volatile Organics by Capillary Column); or a combination of EPA Methods 8010 (Halogenated Volatile Organics), 8015 (Nonhalogenated Volatile Organics) and 8020 (Aromatic Volatile Organics).

2) Semi-Volatile Organics: EPA Method 8270 (Semi-volatile Organics) is recommended when the presence of semi-volatile organics is suspected in the waste stream.

3) Metals: Appropriate EPA Methods for all metals on the Toxicity Characteristics (TC) list (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver).

4) Total Petroleum Hydrocarbons (TPH): EPA Methods 5030/8015 and 5030/8020 to analyze for gasoline in liquid or soil, EPA Method 3510/8015 for diesel in liquid, and EPA Method 3540/8015 for diesel in soil.

For sites where sanitary wastewater was commingled with process water from shop area:

5) Nitrates (NO_3^-): EPA Methods 300.0 and 353.2; Standard Methods 4110B, 4500-NO_3-F, 4500-NO_3-D, and 4500-NO_3-E.

For information on these methods, contact:

EPA Region 10
Quality Assurance Unit
1200 Sixth Avenue, OW-137
(800)424-4EPA

Note:*Some waste streams may contain additional constituents not covered by these methods. In those cases, additional EPA analytical methods must be employed to determine whether other constituents are present at concentrations which violate the primary drinking water standards or may otherwise adversely affect the health of persons.*

6.3 Sampling Equipment

Various types of equipment may be used to collect grab samples from shallow well systems. Typical sampling equipment includes pond samplers, weighted bottles, and bailers. The equipment is usually made of stainless steel, glass or Teflon. Other equipment may be used when the situation warrants. It is important to avoid using equipment or containers that may alter the sample through the introduction of foreign matter. Contaminated sampling equipment can result in leaching or

particulate fallout, volatilization or adsorption of the sample.

1) Pond Sampler: The pond sampler is used when the system is easily accessible and when the sampling point is deeper than arm's length. This sampling device consists of a telescoping aluminum rod to which a stainless steel or nalgene beaker is attached using an adjustable stainless steel C-clamp. The size of the beaker is determined by the volume and number of samples to be collected.

2) Weighted Bottles: Weighted bottles or similar devices may be utilized to sample fluid at a depth below an oil/water interface. Such devices must be lowered below the floating product phase before opening. Fluid from below the interface may then be retrieved.

3) Bailers: The bailer is useful for sampling from small diameter wells, septic tanks, and other areas where openings are too small to permit use of the pond sampler. A bailer is lowered into the fluid with a rope and retrieved with a sample of the fluid.

4) Others: Often sediment samples from the bottom of a sump are collected using a beaker attached to a pond sampler. A stainless steel lab scoop is generally used to transfer the sediment from the beaker to the required container. Trowels and drive samplers are also used to collect samples.

6.4 Equipment Decontamination

All sampling equipment must be decontaminated before and after each sampling event. All quality control equipment blank samples must be obtained after equipment has been thoroughly decontaminated, prior to collecting fluid, sediment or soil samples. Decontamination procedures should be as follows:

1) Disassemble equipment
2) Wash with non-phosphate detergent (alconox) and tap water
3) Rinse with tap water
4) Rinse with isopropyl alcohol (use a squirt bottle)
5) Triple rinse with deionized or distilled water
6) Rinse with acid
7) Rinse with certified organic free (HPLC grade) water

6.5 Miscellaneous Sampling Requirements

1. Sample Labelling: All samples should be tagged with an identification number; the date and time of sample collection; type of sample (water, sediment, soil etc.); signature of the sampler; whether the sample is preserved or unpreserved; the general types of analyses to be conducted; and, if the sample is known or thought to be hazardous, the tag should be so marked with information on the nature of the hazard (e.g. corrosive, flammable, poisonous).

2. Field Documentation: Field information about sampling efforts should include sample identification numbers; date and time of sample collection; description of the location of the collection; the collection method; the rationale for selecting the sample and representativeness of the sample; and a description of any deviations from standard protocols.

3. Sample Packaging and Transportation: Samples should be packaged to prevent breakage. The shipping container should be sealed or locked so that any evidence of tampering may be readily detected. Packaging, labeling and shipping of samples must follow the Department of Transportation

(DOT) regulations. Samples that meet DOT's hazardous materials criteria must be packed and labeled according to the requirements set forth in 49 CFR 172.101.

6.6 Quality Assurance/Quality Control

Quality assurance (QA) is the process of assuring that data obtained are technically sound and properly documented. Quality control (QC) procedures are employed to measure the degree to which quality assurance objectives are met. The laboratory is not informed of the existence of field QC samples.

This section is intended to provide guidelines on some of the minimum requirements necessary to ensure the quality of the data produced during sampling/analysis activities. **The regulated facilities are responsible for the quality of the data produced**, and are expected to provide data of known, documented, and verifiable quality.

Following is a list of some of the quality control samples which can be employed. Blanks are a check for cross-contamination during sample collection and shipment and in the laboratory. Use analytically-certified organic-free (HPLC grade) water for organic parameters and metal-free (deionized-distilled) water for inorganic parameters. In general, at least one replicate sample, and one type of blank must be obtained for every ten field samples. If there are less than ten field sampling points, at least one replicate sample and one type of blank must be obtained.

1. Equipment Blanks: Quality control equipment blanks are used to assess the caliber of field decontamination procedures. After the sampling equipment has undergone decontamination procedures, the appropriate (certified metal-free or organic-free) water is poured into the sampling equipment and from there into sampling containers. These containers are preserved, documented and analyzed in exactly the same manner as those containers holding samples of waste fluid.

2. Field Blanks: This type of sample should be collected when equipment decontamination is unnecessary and when a sample collection vessel will not be used. The field sample should be taken at the sampling point. The sample consists of the appropriate (certified metal-free or organic-free) water to which the same quantity of preservative is added as is added to the field samples. These samples provide a check on any contamination of chemical preservatives.

3. Trip Blanks: Trip blanks are used to detect contamination or cross-contamination which may have occurred during sample handling and transportation. These blanks must be prepared prior to the sampling effort and will accompany sample containers used during sampling and in the transport cooler. The trip blanks consist of certified metal-free, organic-free water and will be analyzed by a certified laboratory at the time the other samples are analyzed.

4. Replicate Samples: Replicate sampling is used to determine consistency in both sampling procedures and analytical methods. In general, replicate samples must be obtained at one out of every ten sampling points, and at least one replicate sample must be obtained if there are less than ten sampling points. To collect these samples, fluid is obtained from a sampling point and split between two identical containers. Both containers undergo the same method of analysis at the laboratory.

5. Split Samples: A split sample is divided into two containers for analysis by separate laboratories. The purpose of this type of sample is to independently confirm laboratory results.

6. Spiked Samples: A spiked sample is produced by adding a known quantity of analyte(s) of interest to the sample. Spiked samples are used to check the accuracy of analytical procedures.

7. Additional Information and Forms

This section includes copies of forms you may need in order to be authorized by rule to operate your shallow injection well. It also contains an index of key terms and definitions used by the EPA UIC program.

7.1 Inventory Forms

EPA inventory forms can be downloaded from EPA Region 10's website at www.epa.gov/region10/uic.htm

The UIC State Primacy program inventory forms also can be downloaded from the EPA Region 10's website at the address listed above. For more information, please contact the UIC staff listed above.

7.2 Additional Resources and Bibliography

American Petroleum Institute: *Best Management Practices for Service Station Floor Drains,* March 1990.

Arizona Department of Environmental Quality Aquifer Protection Program: *Clean Closure Guidance (draft)*, May 1997.

California Department of Health Services, Toxic Substances Control Division: *Hazardous Waste Reduction Checklist: Automotive Repair Shops*, October 1988.

California Department of Water Resources, Division of Local Assistance: *Compilation of Sediment and Soil Standards, Criteria and Guidelines*, February 1995. (access by wwwdpla.water.ca.gov/)

County of Kern Department of Environmental Health Services: *Closure of Shallow Disposal Wells,* undated

Massachusetts Department of Environmental Protection: *Massachusetts Closure Requirements for Shallow Injection Wells*, December 1994.

Santa Clara Valley Water District: *Excavation Backfilling Well Standard Implementation Draft Guidance*, February 1991.

U.S. EPA, Office of Research and Development: *Guides to Pollution Prevention: The Automotive Repair Industry*, EPA/625/7-91/013, October 1991.

U.S. EPA, Office of Solid Waste and Emergency Response: *Introduction to Closure/Post-Closure per 40 CFR parts 264/265, Subpart G*, November 1997, EPA 530-R-97-048.

U.S. EPA, Office of Solid Waste and Emergency Response: *Soil Screening Guidance: Technical Background Document*, May 1996EPA/540/R-95/128.

U.S. EPA, Office of Ground Water and Drinking Water: *Does your facility generate automotive service wastes?* (undated)

7.3 Definitions (from 40 CFR part 144.3 except where otherwise noted)

Closure (per Section 144.23

Contaminant means any physical, chemical, biological or radiological substance or matter in water.

Fluid means any materials or substance which flows or moves whether in a semisolid, liquid, sludge, gas or any other form or state.

Ground water means water below the land surface in a zone of saturation.

Manifest means the shipping document originated and signed by the generator which contains information required by subpart B of 40 CFR part 262.

Permit means an authorization, license, or equivalent control document issued by EPA or an approved State to implement the requirements of this part... Permit does not include UIC authorization by rule (144.21)...

RCRA means the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976.

SDWA means the Safe Drinking Water Act, as amended.

Underground source of drinking water (USDW) means an aquifer or its portion:
(a) (1) which supplies any public water system; or
(2) contains a sufficient quantity of ground water to supply a public water system; and
(i) currnetly supplies drinking water for human consumption; or
(ii) contains fewer than 10,000 mg/l total dissolved solids, and
(b) which is not an exempted aquifer.

Well means a bored, drilled or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension, and drainfields.

Well injection means the subsurface emplacement of lfluids through a bored, drilled, or driven well, or through a dug well, where the depth of the dug well is greater than the largest surface dimension.

7.4 UIC Program Contacts in EPA Region 10

Alaska:
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Thor Cutler, EPA Region 10, 1200 Sixth Avenue, OW-137, Seattle, WA, 98101
(206) 553-1673 – cutler.thor@epa.gov

Comments on these guidelines, and any other correspondence related to the closure of a particular well site, should be directed to:

U.S. EPA - Region 10
Ground Water Protection Unit
Underground Injection Control Program
1200 Sixth Avenue, OW-137
Seattle, WA 98101

Questions concerning the Region 10 UIC program: call (800)424-4EPA, or the Safe Drinking Water Act Hotline at (800) 426-4791, or internet at www.epa.gov/region10/uic.htm.